IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Applicants:	:	Leroy Dickson et al.
Serial No.	:	09/965,123
Filing Date	:	September 27, 2001
Title of Invention	:	DOE-BASED SYSTEMS AND DEVICES FOR PRODUCING LASER BEAMS HAVING MODIFIED BEAM CHARACTERISTICS
Examiner	:	Fayez G. Assaf
Group Art Unit	:	2872
Attorney Docket No.	:	108-010USANA0

Honorable Commissioner of Patents
and Trademarks
Washington, DC 20231

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. 1.97

Sir:

In order to fulfill Applicants' continuing obligation of candor and good faith as set forth in 37 C.F.R. 1.56, Applicants submit herewith an Information Disclosure Statement prepared in accordance with 37 C.F.R Sections 1.97, 1.98 and 1.99.

The disclosures enclosed herewith are as follows:

U.S. PUBLICATIONS

NUMBER	FILING DATE	TITLE
6,092,728	July 12, 1999	MINIATURE LASER DIODE FOCUSING MODULE USING MICRO-OPTICS
6,072,607	May 30, 1997	OPTICAL PICKUP DEVICE
6,057,947	December 24, 1997	ENHANCED RASTER SCANNING ASSEMBLY
5,663,980	May 22, 1995	SEMICONDUCTOR LASER DEVICE HAVING CHANGEABLE WAVELENGTH, POLARIZATION MODE, AND BEAM SHAPE IMAGE
5,610,734	February 9, 1995	CHROMATIC FOCAL PENCIL BEAM-

		GENERATING APPARATUS
5,422,746	September 11, 1992	SINGLE AND MULTIPLE ELEMENT HOLOGRAPHIC DEVICES FOR HIGH-EFFICIENCY BEAM CORRECTION
5,237,451	November 4, 1992	BEAM SHAPING SYSTEM USING DIFFRACTION
5,089,903	June 1, 1989	DISPLAY APPARATUS
4,767,202	January 18, 1985	OPBJECTIVE LENS SYSTEM FOR OPTICAL RECORDING TYPE DISKS
4,623,225	June 29, 1984	ANAMORPHIC PRISM FOR BEAM SHAPING

FOREIGN PUBLICATIONS

NUMBER	PUBLICATION DATE	TITLE
EP 0 691 622 A1	January 10, 1996	BEAM SHAPING FOR OPTICAL SCANNERS
DE 4214014 A1	April 29, 1992	ANAMORPHOTISCHE ANORDNUNG ZUR EINACHSIGEN KOMPRESSION VON KOLLIMIERTEM LASERLICHT

TECHNICAL PUBLICATIONS

Scientific publication entitled "A Substrate-Mode Holographic Collimating and Beam Shaping Element for Laser Diodes" by Jen-Tsorng Chang, Der-Chin Su, and Zhi-Xian Huang, American Institute of Physics, Vol. 70, No. 8, 1997, pages 919-921.

Scientific publication entitled "Design of an Optical Pickup using Double Holographic Lenses" by Hiroyasu Yoshikawa, Shin-ya Hasegawa, Fumio Yamagishi and Masato Nakashima, SPIE, Vol. 2652, January 1996, pages 334-340.

Scientific publication entitled "Mode Control of Semiconductor Laser with Diffraction and Dispersion Feedback" by G. Xu, R. Tsuji, K. Fujii, S. Nakayama, M. Amano, H. Kiyono, Y. Uchiyama, Y. Tokita, Y. Hanasawa, S.B. Mirov, M.J. McCutcheon, and J.R. Whinnery, 1996 American Institute of Physics, pages 849-853.

Scientific publication entitled "Beam-Shaping of Laser Diodes with Binary Diffraction Optics"

by J.M. Asfour and T. Tschudi, SPIE, Vol. 2041, 1994.

Scientific publication entitled "Beam-Correcting Holographic Doublet for Focusing Multimode Laser Diodes" by A Aharoni, J.W. Goodman and Y. Amitai, Optics Letters, Vol. 18, No. 3, February 1993, pages 179-181.

Scientific publication entitled "Efficient Beam-Correcting Holographic Collimator for Laser Diodes" by A. Aharoni and J. W. Goodman, Optics Letters, Vol. 17, No. 18, September 1992, pages 1310-1313.

Scientific publication entitled "Design and Fabrication of Diffractive Optical Elements for Beam Shaping and Imaging" by H.P. Herzig and R. Dandiker, SPIE, Vol. 1718, 1992, pages 130-139.

Scientific publication entitled "Beam Shaping by Holographic Filters" by Nicholas C. Roberts, Applied Optics, Vol. 28, No. 1, January 1998, pages 31-33.

Scientific publication entitled "Lensless Holographic Line Scanner" by Fumio Yamagishi, Shinya Hasegawa, Hiroyuki, Ikeda and Takefumi Inagaki, SPIE, Vol. 615, 1986, pages 126-132.

Scientific publication entitled "Design Trade-Offs for a Diode Laser Holographic Scanner" by David Doggett, Stephen Barasch, Mary Jane Wegener, SPIE, Vol. 299, 1981, pages 151-156.

Chapter 19 of the textbook entitled "Optical Holography", the chapter being entitled "Computer Generated Holograms " by Robert J. Collier, Christoph B. Burckhardt and Lawrence H. Lin, Bell Telephone Laboratories, Inc., 1971, pages 542-563.

INTERNATIONAL SEARCH REPORTS

App. No.	Filing Date
PCT/US99/09603	April 30, 1999

STATEMENT OF PERTINENCE

U.S. Letters Patent No. 6,092,728 to Li et al. discloses a miniature module which emits and focuses a divergent light beam. The focusing module consists of small-sized light emitter, such as a laser diode, and a micro-optical element seated in a lens holder. The outside diameter of the micro-optical element is 4 mm or less and preferably less than or equal to 2.5 mm. The micro-optical element may be a small conventional lens, a gradient index lens, or one of several types of diffractive optical elements. The focal length of the module relative to the light from the emitter is set by sliding the lens holder along its central axis and permanently adhering it in place with respect to the emitter after focusing. During focal adjustment, axial rotation between the lens holder and between the base of the emitter is prevented by a series of notches.

U.S. Letters Patent No. 6,072,607 to Tajiri et al. discloses an optical pickup device which

includes a substrate having at least a major surface, a semiconductor laser provided on the surface of the substrate for emitting the laser beam, a reflection-type diffraction grating oriented to the semiconductor laser for splitting the laser beam into at least three beams and reflecting them upward, a hologram for receiving the three beams reflected from the reflection-type diffraction grating, and an objective lens for converging onto an optical recording medium the three beams transmitted by the hologram. The three beams reflected from the optical recording medium are focused by the hologram and directed onto the photodetector from the above.

U.S. Letters Patent No. 6,057,947 to Hobbs et al. discloses an optical assembly utilizing a novel optical element. The assembly includes a tunable source of input radiation; an optical element that can receive at least a portion of the input radiation and comprises a manifold having at least two independent surfaces, in which at least a portion of each independent surface is selected from the group consisting of a reflective structure and a diffractive structure, and the independent surfaces are geometrically configured so that a portion of incident radiation to the manifold is diffracted at least twice in an angular sense that can increase a tuning sensitivity of an angular deviation of the incident radiation exiting the manifold; and, a scanner means which can accept and redirect a portion of the radiation output by the optical element for producing an illumination pattern.

U.S. Patent No. 5,663,980 to Adachi discloses a semiconductor laser device that is modular so to be readily changed to produce laser configurations for a broad spectrum of applications, using a minimum of components. A set of semiconductor modules covering wavelengths and polarizations of interest in specific technologies can be coupled to one of two beam shaping modules and projected through a selected objective optics module to provide large and small circular beams as well as broad and narrow line segments. Resolution enhancing and diffraction limiting filter may be included in the objective optics.

U.S. Patent No. 5,610,734 to Aharoni, et al. discloses an optical system which focuses a polychromatic source to an extended focal pencil. The implementation makes use of two holographic optical elements (HOEs) fabricated and aligned to form a deliberate longitudinal color dispersion, but to alleviate lateral chromatic effects. Consequently, the HOE doublet focuses different wavelengths of the source to different locations along the optical axis. The strong intensity of the focused wavelengths dominate at each location, so that the overall beam has a near-diffraction-limited $1/e^2$ spot size and suffers only relatively weak background illumination. An alternative optical system using bulk lenses and several possible applications for the device are also described.

U.S. Patent No. 5,422,746 to Aharoni, et al. discloses a method for fabricating a holographic optical element for use in diffracting laser beams. The holographic element of the present invention includes a holographic grating pattern that is impressed in the media of the element utilizing beams of electromagnetic energy of wavelength λ_o. The holographic grating pattern is capable of manipulating a beam of electromagnetic energy having a wavelength λ_c at which the media is not necessarily suitable for recording. The method for manufacturing the holographic element utilizes an object beam and a reference beam having aspherical wavefronts of wavelength λ_o to create the grating pattern in the media. In the preferred embodiment, the aspherical object beam and reference beam are created utilizing parent holographic devices recorded with spherical beams. An alternative embodiment of the present invention is a doublet

holographic device which incorporates two holographic elements that are formed in accordance with the present invention to manipulate a beam of electromagnetic energy of wavelength λ_o in a desired manner. The invention is particularly useful in obtaining high-quality volume phase holograms for use outside of the blue-green spectral range. A particular application is manipulating beams of electromagnetic energy from infrared laser diodes.

U.S. Letters Patent No. 5,237,451 to Saze discloses a beam shaping system for astigmatic light source which utilizes two lenses, both having diffractive power. A first lens shapes the beam in a first dimension and a second lens shapes the beam in a second dimension perpendicular to the first.

U.S. Letters Patent No. 5,089,903 to Kuwayama discloses a display apparatus comprises a display, a first diffraction grating for diffracting light from the display, and a second diffraction grating for diffracting diffracted light from the first diffraction grating, so that a half-width of the first diffraction grating is set to be larger than that of the second diffraction grating.

U.S. Letters Patent No. 4,767,202 to Hata et al. discloses an objective lens system for optical recording type disks, comprising from a light source side to a disk side; a first lens element having a positive refractive power, said first lens element having at least an aspherical surface; a second lens element having a positive refractive power; and wherein the objective lens system fulfills the following condition: $-\frac{1}{2} < \beta < -\frac{1}{2}$ wherein β represents the magnification of the whole lens system.

U.S. Letters Patent No. 4,623,225 to Forkner discloses a device for shaping a beam of light comprising a single anamorphic prism having an input face for receiving a beam of light, and an output face for outputting the beam of light. A reflecting face reflects light from the input face to the output face. The faces are oriented to cause the beam exiting the output face to be substantially parallel to the beam entering the input face. The prism is sized to provide colinearity of the input and output light.

European Patent Application No. EP 0 691 622 A1 to Symbol Technologies, Inc. discloses an optical scanner such as a bar code scanner which includes a laser diode to create the scanning laser beam. Laser diodes are characteristically astigmatic, and when passed through a rotationally symmetric lens the beam typically forms a waist both in the x (scanning) direction and in the y (perpendicular) direction. The width of the beam envelope in the x direction is adjusted by means of a conventional lens. The width of the beam envelope in the y direction is adjusted by the use of a non-planar mirror, preferably a cylindrical mirror, as the rotating or oscillating element.

The scientific article entitled "A Substrate-Mode Holographic Collimating and Beam Shaping Element for Laser Diodes," by Jen-Tsorng Chang et al. describes a type of substrate-mode holographic collimating and beam shaping element for laser diodes. As disclosed, the device comprises a laser diode, a pair of asymetrical holographic lenses supported within a BK7 monolithic Bkr glass substrate of 22 mm. thickness. Techniques and design are described, and a sample is fabricated for demonstrative purposes.

The scientific article entitled "Design of an Optical Pickup Using Double Holographic Lenses" by Hiroyasu Yoshikawa et al. describes an optical pickup system for optical disc drives which utilizes optical elements for information signal detection, focus-error detection and track-error detection. An optical pickup using double holographic lenses – replacing conventional optical elements for focus-error detection and track-error detection – to reduce the pickup size, is proposed. Two important requirements for using holograms for an optical pickup are described. The first is the compensation for chromatic aberration caused by laser diode wavelength deviation, and the second is the acquisition of an appropriate beam spot size for focus-error detection. To meet these requirements, double holograms are used, where one has divergent power and the other convergent power. By optimizing the double hologram pattern, the optical system is achromatized, and the achromatic effect, 0.07 λ (RMS) for a laser diode wavelength change of ± 10 *nm* is effected. The beam position error was less than $\pm 1 \mu m$. The NA of the system is reduced to give a relatively large spot beam and a large depth of focus.

The scientific article entitled "Mode Control of Semiconductor Laser with Diffraction and Dispersion Feedback" by G. Xu et al. describes the construction of two kinds of external cavity semiconductor laser. The first is a diffraction feedback system consisting of a collimating lens, a diffraction grating and a mirror controlled by a PZT element. The second is a dispersion feedback system in which the diffraction grating is replaced with a prism. Changing the angle of the external mirror by controlling the voltage to be supplied to the PZT, the longitudinal mode of semiconductor laser is able to be continuously tuned in the range of about 1GHz.

The scientific article entitled "Beam-Shaping of Laser Diodes with Binary Diffraction Optics" by J.M. Asfour et al. disclose a diffractive-optical system consisting of one single, binary computer-generated hologram (CGH) having a high numerical aperture (N.A.>07) for collimating or focusing a laser beam produced from a laser diode.

The scientific article entitled "Beam-Correcting Holographic Doublet for Focusing Multimode Laser Diodes" by Aharoni et al. describes a beam-correcting, holographic focusing doublet for laser diodes in the presence of a recording-to-readout wavelength shift. This two-hologram assembly compensates for the strong chromatic variation of the spot size and its lateral position, which are typical of a single diffractive element. The doublet, recorded at 488 nm, successfully corrects the astigmatism of a multimode laser diode beam at 820 nm and focuses it to a near-diffraction-limited $1/e^2$ spot width with a significantly extended depth of field.

The scientific article entitled "Efficient Beam-Correcting Holographic Collimator for Laser Diodes," by Aharoni et al. describes an optical system for shaping an elliptical laser beam produced from a visible laser diode (VLD). As disclosed, the system comprises a first holographical element on-axis with the VLD source for collimating light at an off-axis diffraction angle. A second holographic optical element is provided for focusing the beam and collecting residual beam ellipticity.

The scientific article entitled "Design and fabrication of diffractive optical elements for beam shaping and imaging," by H.P. Herzig and R. Dandliker describes a device comprising two antisymmetric holograms (HOE's) for eliminating the lateral focal position variation, and compensating for focal spot size variation.

The scientific article entitled "Beam Shaping by Holographic Filters," by Nicholas C. Roberts describes a device which uses a pair of holographic filters for flattening the Gaussian profile of an input elliptical laser beam using a pair of holographic filters.

The scientific article entitled "Lensless Holographic Line Scanner," by Fumio Yamagishi et al. describes (in Fig. 4) a lensless holographic line scanner, wherein a holographic lens is disposed between the visible laser diode (VLD) and holographic scanning disc in order to circularize the laser diode beam, correct scanning beam aberrations and reduce positioning error caused by mode hopping of the (VLD).

The scientific article entitled "Design Trade-Offs for a Diode Laser Holographic Scanner" by David Doggett et al. describes various techniques for designing and fabricating diffractive optical elements (DOEs) for beam shaping and imaging application.

The chapter of Optical Holography entitled "Computer-Generated Holograms" by Robert J. Collier et al. describes an introduction to computer-generated holograms (CGH).

A separate listing of the above references on PTO Form 1449 and a copy of these references are enclosed herewith for the convenience of the Examiner.

Enclosed in payment of the requisite fee of $180.00 is Thomas J. Perkowski, Esq., PC Check No. 3897 (in the amount of $1,130.00). The Commissioner is also authorized to charge any fee deficiencies to Deposit Account No 16-1340.

Respectfully submitted,

Dated: December 3, 2003

Thomas J. Perkowski
Reg. No. 33,134
Attorney for Applicants
Thomas J. Perkowski, Esq., P.C.
Soundview Plaza
1266 East Main Street
Stamford, Connecticut 06902
203-357-1950
http://www.tjpatlaw.com

Certificate of Mailing under
37 C.F.R. 1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service on December 3, 2003, in a Postage Prepaid envelope as, First Class Mail, addressed to:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Thomas J. Perkowski, Esq.
Date: December 3, 2003

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	4

Complete If Kn wn	
Application Number	09/965,123
Filing Date	September 27, 2001
First Name Inventor	Dickson et al.
Group Art Unit	2872
Examiner Name	Fayez G. Assaf
Attorney Docket Number	108-010USANA0

U.S. PATENT DOCUMENTS

Examiner Initials	Cite No.	U.S. Patent Documents		Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class
		Number	Kind Code (if known)			
		6,092,728		Li et al.	07/25/2000	G06K 7/10
		6,072,607		Tajiri et al.	06/06/2000	G02B 5/32
		6,057,947		Hobbs et al.	05/02/2000	G02B 5/32
		5,663,980		Adachi	09/02/1997	H01S 3/08
		5,610,734		Aharoni et al.	03/11/1997	G82B 5/32
		5,422,746		Aharoni et al.	06/06/1995	G02B 005/3
		5,237,451		Saxe	08/17/1993	G02B 5/18
		5,089,903		Kuwayama et al.	02/18/1992	G02B 27/14
		4,767,202		Hata et al.	08/30/1988	G02B 13/18
		4,623,225		Forkner	11/18/1986	G02B 13/10

FOREIGN PATENT DOCUMENTS								
Examiner Initials		Foreign Patent Document			Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class	T *
		Numbe r	Kind Code (if known)					
		EP	EP 0 691 622 A1		Symbol Technologies, Inc.	01/10/1996		
		DE	DE 4214014 A1		Eta-Optik Gesellschaft fur optische Mebtechnik mbH	04/29/1992		

PUBLICATIONS		
Examiner Initials	Cite No.	Description
		Scientific publication entitled "A Substrate-Mode Holographic Collimating and Beam Shaping Element for Laser Diodes" by Jen-Tsorng Chang, Der-Chin Su, and Zhi-Xian Huang, American Institute of Physics, Vol. 70, No. 8, 1997, pages 919-921.
		Scientific publication entitled "Design of an Optical Pickup using Double Holographic Lenses" by Hiroyasu Yoshikawa, Shin-ya Hasegawa, Fumio Yamagishi and Masato Nakashima, SPIE, Vol. 2652, January 1996, pages 334-340.
		Scientific publication entitled "Mode Control of Semiconductor Laser with Diffraction and Dispersion Feedback" by G. Xu, R. Tsuji, K. Fujii, S. Nakayama, M. Amano, H. Kiyono, Y. Uchiyama, Y. Tokita, Y. Hanasawa, S.B. Mirov, M.J. McCutcheon, and J.R. Whinnery, 1996 American Institute of Physics, pages 849-853.
		Scientific publication entitled "Beam-Shaping of Laser Diodes with Binary Diffraction Optics" by J.M. Asfour and T. Tschudi, SPIE, Vol. 2041, 1994.
		Scientific publication entitled "Beam-Correcting Holographic Doublet for Focusing Multimode Laser Diodes" by A Aharoni, J.W. Goodman and Y. Amitai, Optics Letters, Vol. 18, No. 3, February 1993, pages 179-181.
		Scientific publication entitled "Efficient Beam-Correcting Holographic Collimator for Laser Diodes" by A. Aharoni and J. W. Goodman, Optics Letters, Vol. 17, No. 18, September 1992, pages 1310-1313.
		Scientific publication entitled "Design and Fabrication of Diffractive Optical Elements for Beam Shaping and Imaging" by H.P. Herzig and R. Dandiker, SPIE, Vol. 1718, 1992, pages 130-139.
		Scientific publication entitled "Beam Shaping by Holographic Filters" by Nicholas C. Roberts, Applied Optics, Vol. 28, No. 1, January 1998, pages 31-33.
		Scientific publication entitled "Lensless Holographic Line Scanner" by Fumio Yamagishi, Shinya Hasegawa, Hiroyuki, Ikeda and Takefumi Inagaki, SPIE, Vol. 615, 1986, pages 126-132.
		Scientific publication entitled "Design Trade-Offs for a Diode Laser Holographic Scanner" by David Doggett, Stephen Barasch, Mary Jane Wegener, SPIE, Vol. 299, 1981, pages 151-156.
		Chapter 19 of the textbook entitled "Optical Holography", the chapter being entitled "Computer Generated Holograms " by Robert J. Collier, Christoph B. Burckhardt and Lawrence H. Lin, Bell Telephone Laboratories, Inc., 1971, pages 542-563.

PUBLICATIONS		
Examiner Initials	Cite No.	Description
		International Search Report for Application No. PCT/US99/09603

EXAMINER **DATE CONSIDERED**

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance not considered. Include copy of this form with next communication to applicant.

(INFORMATION DISCLOSURE STATEMENT – SECTION 9 PTO-1449)